CLAIMS

1. A sheet-type β-$FeSi_2$ element forming a junction thin-film element comprising two kinds of β-$FeSi_2$ semiconductor thin-films with p-type and n-type characteristics on a flexible sheet, wherein

a part of the junction thin-film element is changed into an α-Fe_2Si_5 metal film for an electrode, and, furthermore,

a film of dielectric substance is provided as a surface protective layer on the surface of the junction thin film element for device functions.

2. The sheet-type β-$FeSi_2$ element according to claim 1, wherein

a metal thin-plate, in which iron, nickel, and copper are independently used, or alloys comprising them or alloys comprising them as principal ingredients and one or more kinds of additional elements are included, is adopted as the flexible sheet.

3. The sheet-type β-$FeSi_2$ element according to claim 1, wherein

a resin film using polyimide or fluoropolymers is used as the flexible sheet.

4. A method for manufacturing a sheet-type β-$FeSi_2$ element, wherein

fine powders are coated by a spraying method or a coating method by printing and dried for deposition in uniform thickness on a flexible sheet after impurities are added to powders of

Fe and Si with an atomic ratio of about 1 to 2 as raw materials for dissolution, solidification, and pulverization into the fine powders,

heating processing at 500 °C to 900 °C is executed to form a first β-$FeSi_2$ semiconductor thin-film,

fine powders are deposited in uniform thickness on the first β-$FeSi_2$ semiconductor thin-film above the flexible sheet by the spraying method or the coating method by printing after impurities with the opposite characteristic to that of the first β-$FeSi_2$ semiconductor thin-film are added to powders of Fe and Si with an atomic ratio of about 1 to 2 as raw materials for dissolution, solidification, and pulverization into the fine powders,

heating processing at 500 °C to 900 °C is executed to form a second β-$FeSi_2$ semiconductor thin-film, and finally two kinds of the β-$FeSi_2$ semiconductor thin-films forming a p-n junction interface between them are formed.

5. The method for manufacturing a sheet-type β-$FeSi_2$ element according to claim 4, wherein

a powder layer deposited on the flexible sheet is pressed by a heating roller superheated at 500 °C to 900 °C in a non-oxidation atmosphere, and

two kinds of the β-$FeSi_2$ semiconductor thin-films forming a p-n junction interface between them are manufactured by continuous heat processing as a technique by which reaction of mixed powders comprising an Fe ingredient and a Si ingredient,

which are deposited on the flexible sheet, is executed to form the mixed powders in a β-$FeSi_2$ phase.

6. The method for manufacturing a sheet-type β-$FeSi_2$ element according to claim 4, wherein

a part which is in contact with a heating roller for forming an electrode when the heating roller for forming an electrode is pressed on the flexible sheet with the β-$FeSi_2$ semiconductor films, which is continuously moving, is made into an electrode, after the heating roller for forming an electrode provided with sculptures which are sculpted in such a way that an electrode pattern is obtained later is heated.

7. The method for manufacturing a sheet-type β-$FeSi_2$ element according to claim 4, wherein

ink obtained by diluting hydroxide salt or nitrate salt of an inorganic substance such as silicon, tin, zinc, and zirconia is deposited in very thin thickness on the surface of the β-$FeSi_2$ semiconductor element formed on the flexible sheet which is continuously moving, using the spraying method, or the coating method by printing, and, then,

a thin film of transparent dielectric substance is formed for a light-antireflection protective film by a baking furnace, or by a method in which the flexible sheet is moved under a flash lamp for heating, or in which the sheet is pressed by a heated roller at a high temperature.

8. An device for manufacturing a sheet-type β-$FeSi_2$ element, comprising;

a step at which powders with p-type or n-type characteristics are deposited on a sent flexible sheet;

a step at which, after the flexible sheet is moved from a point for the step, β-$FeSi_2$ semiconductor thin-films are continuously formed by pressing a heating roller onto a powder layer on which the powders are deposited;

a step at which, after the flexible sheet is further moved from points for the steps, a part of the β-$FeSi_2$ semiconductor thin-film is changed into a film in a α-Fe_2Si_5 metal phase for an electrode by a heating roller for sculpting an electrode pattern; and

a step at which, after the flexible sheet is still further moved from points for the steps, a film of transparent dielectric substance is formed by placing a sol-gel thin layer and passing it through a piece of heating means, wherein

all of the steps are executed in an integrated manner for continuous manufacturing of a device.